



# MSc Thesis – Analyzing the effects on battery cells during disassembly

## Background

After their initial use, electric vehicle (EV) battery packs retain approximately 80% of their original capacity, making them suitable for second-life applications that extend their utility and reduce environmental impact. However, preparing batteries for these applications requires dismantling the pack into individual modules or cells, a process complicated by the use of thermally conductive adhesives. These adhesives are favored for their thermal conduction, electrical insulation, and crash resistance properties but pose significant challenges for disassembly at end-of-life. Their mechanical properties, designed for operational durability, hinder the separation of cells and limit the efficiency of second-life processes. Developing methods to safely manipulate and debond these adhesive connections is critical to enhancing the viability of second-life applications and improving resource efficiency.



Source: <https://www.motortrend.com/features/tesla-battery-warranty/>

**Your goal** is to develop a method that utilizes experimental tests and simulations to analyze stress on the battery cell during adhesive joint disassembly and evaluate their separability.

## Tasks

- **Get familiar** with disassembly process validation (experimental testing and simulation).
- **Understand** the mechanical stress in the adhesive joint during the dismantling.
- **Develop** a simulation model to analyze the effects on battery cells during a disassembly process.
- **Implement your ideas** to improve the reusability of lithium-ion batteries by creating innovative validation approaches.
- **Cooperate** with renowned industry partners

## Literature

- Scott et al.(2023): *Designing lithium-ion batteries for recycle: The role of adhesives*. DOI: 10.1016/j.nxener.2023.100023
- Caglar et al (2024): *Stress Analysis of Glass Fiber-Reinforced Polymer Lap Joints with Modified Adhesives at Various Temperatures*. DOI: 10.3390/jcs8100406

**Recommended as** Master thesis for technical studies (Mechanical Engineering, Mechanical Engineering and Business Economics) interested in battery safety and circular economy.

## Organizational

- **Start:** at any time as of January 2025
- **Language:** German or English
- **Scholarship:** min. € 2.500,- for successful completion of the Thesis
- **Contact:** Stefan Grollitsch, [stefan.grollitsch@tugraz.at](mailto:stefan.grollitsch@tugraz.at)

